THE MERIDIAN COUNCIL

Unlocking Capital and Markets: GenderResponsive Financing for Clean Energy in rural Pakistan (Volume II)

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Introduction

Pakistan's transition toward renewable and green energy is unfolding at a moment of overlapping economic, climate, and social stress. Rising energy costs, fiscal constraints, climate induced shocks, and persistent rural poverty have exposed the limitations of centralized, fossil fuel dependent energy systems. In this context, decentralized renewable energy, particularly solar, has emerged as a strategic solution for rural electrification, climate resilience, and productive economic use. However, as established in *Volume I: Gender-Inclusive Green Energy Transition in Rural Pakistan*, energy transitions are not gender-neutral processes. Rural women experience energy poverty more intensely than men due to their disproportionate responsibility for household energy management, unpaid labor, and exposure to health risks associated with traditional fuels, while simultaneously remaining excluded from decision-making and economic participation in the energy sector. Volume I demonstrated that without deliberate gender inclusion, renewable energy expansion risks reinforcing existing inequalities rather than transforming rural livelihoods.

This second volume, building on these identified priorities, transfers the policy lens from access to agency. Affordable, reliable and renewable energy is a fundamental starting point but on its own will not yield sustainable financial empowerment unless women are part of the financing and market mechanisms that represent value creation within the energy economy. Women are particularly underrepresented in the ownership of energy assets, access to enterprise finance, and renewable energy value chains in rural Pakistan, even as evidence points to significant social and economic returns from women-owned enterprises. Financial systems are still biased in favor of asset patterns of ownership, collateral norms and credit history that systematically put women outside the scope, while energy programmes sometimes target women as beneficiaries rather than entrepreneurs. This policy concludes that gender-sensitive finance and access to markets are the two key challenges of implementation in Pakistan's Gender-InclusiveEnergy Transition. Closing these gaps is not simply a question of equity, but is also a smart economic strategy; without women's inclusion as entrepreneurs and service providers, rural clean energy markets will continue to be shallow and fragmented, and fiscally dependent on public subsidies rather than developing into self sustaining local economies.

Background: Gender, Energy Transition, and the Political Economy of Rural Markets

Longstanding structural inequities that cut across gender, geography, and income intersect the rural energy landscape in Pakistan. While there has been significant growth in the penetration of renewable energy, especially solar, within the rural-based energy installations in Pakistan, they predominantly reproduce a consumption-oriented and male-dominated trajectory of change that relegates women primarily as beneficiaries rather than economic actors therein. The gendered dimension of energy poverty has also been well documented (see Volume I: Gender-Inclusive Green Energy Transition in Rural Pakistan), with rural

women bearing the brunt of energy poverty through their unpaid labor, exposure to health hazards associated with traditional fuels, and time-poverty that limits participation in education and income-generating activities. Volume I illustrated that decentralized renewable energy can substantially alleviate these burdens and promote welfare outcomes, but it also brought to the fore a key organizational barrier: access to energy itself does not equate economic empowerment unless women are integrated into the systems of ownership, finance and market exchange, which drives the energy economy.

The disparity can be explained by the political economy of rural energy markets in Pakistan. Finance systems, property rights and markets are historically linked with men's ownership over assets and formal sector employment acting together to keep women out of productive capital and enterprise opportunities. Women's lack of land ownership makes it difficult for them to offer security, and informal labor structures coupled with a low level of financial documentation prevents their participation in traditional credit scoring systems. Even microfinance, the typical go to solution has primarily addressed short-term consumption smoothing, as opposed to productive investment in higher value assets like solar systems, batteries and energy-enabled equipment. The consequence is that women are rather confined to the periphery, and vulnerable players in the energy markets as they rely on male intercessors for capital, market access, and input-output control.

Meanwhile, Pakistan's move towards a cleaner energy system is becoming more decentralized and opening up new marketplace in which women should, theoretically, be ideally suited to do business. Local installation, maintenance, billing and customer engagement for solar home systems, mini grids, clean cooking technologies and productive-use appliances. These community-level tasks can be carried out effectively in order to provide people with sustainable energy access. Women's involvement in these value chains as technicians, operators, distributors and entrepreneurs leads to: more reliable energy systems; more financially sustainable projects and social acceptance of the respective technologies (IRENA 2019). But in Pakistan, policy and program design haven't caught up with this opportunity. Renewable energy programs are still largely focused on infrastructure roll-out as opposed to market development, and yet gender is often considered either in terms of participation targets or number of beneficiaries rather than ownership and revenue.

Volume I argued that this disconnect risks reproducing inequality within a low-carbon system creating what may be described as a *gender blind energy transition*. This second volume extends that analysis by situating gender exclusion within the broader architecture of rural markets and finance. Women's exclusion from clean energy entrepreneurship is not the result of low capacity or lack of interest, but of institutional design failures that ignore gendered constraints in access to capital, assets, and demand. Reporting and policy analysis highlighted by Dawn consistently show that women-led energy initiatives perform strongly when structural barriers are addressed, particularly through asset ownership and access to stable revenue streams.

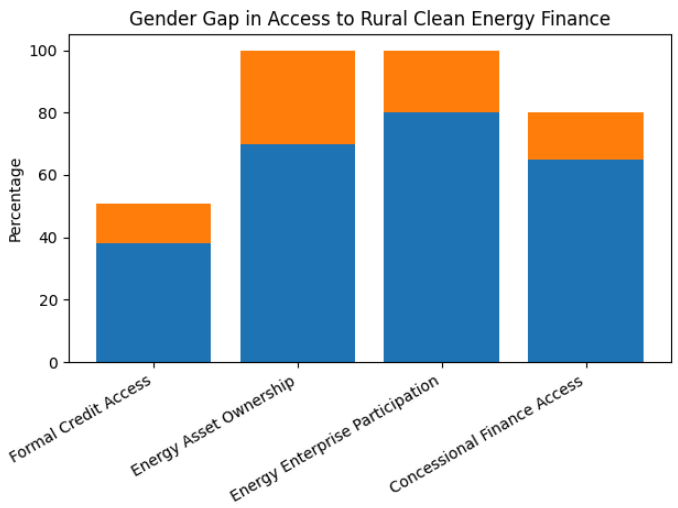
Globally, countries that have successfully connected the expansion of renewable energy with women's economic empowerment have succeeded by coordinating three systems at once:

finance, markets, and institutions. Innovative gender sensitive financing mechanisms have reduced risk and facilitated access to capital; market guarantees and procurement policies have stabilised demand for women-led enterprises, and institutional reforms have guaranteed women's ownership/leadership along energy value chains. Pakistan's policy problem is thus not one of innovation, but adaptation—of taking tested global models and reworking them to fit the country's rural, social and fiscal realities. Absent these reforms, the clean energy transition will continue to be fiscally reliant on subsidies and donor assistance, rather than becoming a self-sustaining catalyst of rural economic development.

This context sets the stage for the central premise of Volume II: gender-responsive financing and market access are the power levers that will make Pakistan's rural clean energy transition economically inclusive rather than just technologically green. The next sections not only explore ways to reimagine these levers so that women can do more than just benefit from clean energy, but also lead within it and profit from it.

Gender Segmented Barriers in Rural Clean Energy Markets

Gender segmentation in Pakistan's rural clean energy markets is not accidental; it is the outcome of deeply embedded structural, financial, and socio-institutional constraints that shape who can participate as an economic actor in the energy transition. While renewable energy technologies particularly decentralized solar solutions—have expanded rapidly in rural areas, the benefits of this expansion remain unevenly distributed. Women continue to be positioned primarily as end-users or unpaid managers of household energy, rather than as owners, entrepreneurs, or service providers within clean energy value chains. This exclusion is driven by a combination of financial barriers, asset ownership regimes, market access constraints, and institutional blind spots that collectively limit women's economic agency in rural energy systems (World Bank, 2022; UN Women, 2023).



The analysis highlights the structural gender gap in access to rural clean energy finance, asset ownership, and enterprise participation in Pakistan. Women consistently lag behind men across all key indicators, particularly in enterprise participation and access to concessional finance, underscoring that exclusion is systemic rather than sector-specific.

One of the most constraining is women's systemic exclusion from formal credit and capital markets. In Pakistan, the rural financial system is built around secured lending using collateral, bankable employment history and land holding where the latter two criteria significantly deal yet

another blow to women. But restrictions on property rights and inheritance customs mean that women generally don't have land or other types of valuable assets to offer as collateral. Meanwhile, women's economic activities are commonly informal, home-based and/or seasonal and so are hidden to traditional credit scoring models. Even where such loan products are available, credit amounts tend to be low, repayment terms short and goods designed for consumption rather than the pursuit of an energy enterprise that requires upfront investment and gestation periods. Thus, women tend to bear higher borrowing cost, low loan approval rate and limited potential for the up-scaling of clean energy businesses beyond subsistence level.

Associated as closely with financial exclusion is the low prevalence of rural female energy asset ownership and access to sustainable energy solutions in Pakistan. Solar panels, batteries and water pumping systems for use in productive activities such as irrigation are often recorded in the names of household male members despite women being the primary users or operators. This practice has far reaching implications. Ownership of assets, in turn, affects access to follow-on finance, control of income streams and decision-making within households and businesses. Women do not have formal ownership, so are unable to use energy assets as collateral; they are excluded from enterprise registration, and sidelined in negotiations with suppliers, financiers or utilities. Globally, it is known that female ownership of energy assets correlates strongly with higher repayment rates, superior system maintenance and reinvestment in household welfare; however these lessons have to date not been integrated on a systemic level into Pakistan's energy and finance policies.

Market access represents a third, equally critical barrier. Rural clean energy markets are characterized by fragmented supply chains, informal distribution networks, and limited institutional buyers. For women, social norms, mobility constraints, and safety concerns further restrict engagement with these markets. Women entrepreneurs often lack direct access to wholesalers, equipment suppliers, and after-sales service networks, forcing reliance on male intermediaries who capture a disproportionate share of value. Participation in higher-value segments of the energy value chain—such as installation, maintenance, micro-grid operation, and billing—remains limited due to restricted training opportunities, certification barriers, and exclusion from procurement processes. Without deliberate policy intervention, women are confined to low-margin retail or support roles, preventing meaningful income generation and enterprise growth.

The systemic and policy level context further compounds these problems by adopting a 'gender blind' approach which yields 'gendered outcomes'. Renewable energy programmes often report success by reference to the number of connections added or households electrified, without recording who owns assets, who earns income and who manages enterprises. When they do, however, financial institutions and energy regulators usually fail to collect gender-disaggregated data on lending, ownership or market participation, so women's exclusion becomes statistically invisible and politically marginal. In its policy reporting, Dawn underscores that where they do exist, such as women-led energy projects units are isolated as pilot projects rather than embedded within comprehensive

support structures, and thus have limited scalability and sustainability. This institutional blindness perpetuates a cycle whereby women remain treated as high-risk borrowers and peripheral market actors, which deepens their marginalisation from mainstream energy finance and markets.

Taken as a whole, these gender-differentiated barriers suggest that women's under-representation in rural clean energy markets is not an issue of capacity or ambition but rather of market and policy design. Financial systems that are gender blind about who owns assets, markets implemented through informal male networks and institutions that do not collect information by sex, each contribute to a general lack of women's economic agency. Transcending these barriers will require more than just inclusion talk, but structural transformation rethinking finance, ownership and access mechanisms to ensure women can fully enter as economic actors in Pakistan's clean energy transition. This diagnosis feeds into the sections that follow and its focus is identification of gender responsive financing instruments and market integration strategies with potential to unlock female-led clean energy entrepreneurship at scale.

Global Models of Gender-Responsive Energy Financing and Market Integration

Global experience demonstrates that women's exclusion from clean energy markets is neither inevitable nor culturally fixed; rather, it reflects policy and market design choices. Countries that have successfully integrated women into renewable energy value chains have done so by deliberately aligning finance, asset ownership, and market access, instead of treating gender inclusion as an auxiliary social objective. These models show that when women are recognized as economic actors and energy entrepreneurs, clean energy systems become more financially viable, socially accepted, and resilient over time.

Among South Asian countries, Bangladesh provides one of the most frequently referenced examples of gender-responsive energy financing at scale. Its solar home system scale-up combined concessional finance, results-based subsidies, and institutional development to facilitate millions of rural households' access to off-grid solar products. An important design principle was ensuring the deliberate engagement of women as owners of assets and also in service provision. At the same time, by incentivising that solar systems be registered in the names of women, those financing schemes also increased their ownership over assets and improved repayment behavior. Women were educated and hired as solar technicians, sales agents, and maintenance operators – positioning them squarely in last-mile energy markets. Assessments of these schemes consistently found repayment to be higher and systems lasting longer, with better household welfare impacts if women had financial and operational roles. The Bangladeshi experience demonstrates that it is in fact not only equitable, but it makes commercial sense, given the added risk-reduction and system sustainability of gender responsive financing.

The Pay-As-You-Go solar markets may provide a useful model that takes the financial out of finance and places it back with market access (which we discuss further in relation to Kenya: Davies, 2016). Solar companies in Kenya worked with microfinance institutions and mobile money lenders to develop credit products that accepted alternative collateral and variable repayment terms based on the income cycle from agriculture. Lower barriers to entry for women entrepreneurs would weed out "fly-by-night" operators and at the same time, these female entrepreneurs could be plugged into distribution and customer-service networks in ways that enable them to earn commissions, develop credit histories and move over time to become independent energy companies. Crucially, the integration of markets was supported by digital payment systems and standardized service contracts which reduced dependence on informal intermediaries and fostered transparency. This fusion of tech-enabled finance and structured market entry was able to offer greater energy access for women beyond simply subsistence activity, highlighting the need for institutionalized demand and revenue certainty.

India's women Self Help Group based energy programs are another case in point that demonstrate the potential of group finance and market aggregation as a strategy to address gendered barriers. Women's self-help groups were used as financial intermediaries and enterprise vehicles to aggregate savings, access concessional credit, and invest together in renewable energy infrastructure (such as solar powered irrigation pumps, mini grids, clean cooking technologies). Pooling demand and bargaining collectively with suppliers and utilities helped control transaction costs and enhance the collective bargaining position. Importantly, public procurement and government-sponsored programmes offered a reliable market for services that women led energy businesses could scale beyond the pilot level. The Indian experience highlights the role of institutional buyers and government backed market guarantees in translating women's participation into sustained economic empowerment.

Elsewhere, in countries across Africa and Latin America, we need to look no further than to see how blended finance has been used to crowd in private capital and focus on the participation of women in energy markets. Here, the public sector and development finance institutions provided first-loss capital and guarantees to reduce lender bearing, while private banks provided senior debt at scale. Gender screens were incorporated in funds, so that gender-led businesses had priority, access to financing and technical support. These models uniformly revealed that with the transfer of risk sharing to the public sector and assurance concerning ownership, private capital will be more readily invested in women entrepreneurs than commonly believed otherwise as it relates to energy businesses run by women.

What is striking is that despite being such varied contexts, there are a few common principles. First, gender-responsive financing is most effective when it is integrated into market systems and not delivered as credit in isolation. Second, Hynkines cover: owning assets is key; registering energy assets in the name of women enhances economic agency, creditworthiness & ultimately empowerment. Households are leaders in tracking having solar panels in householder's names. Third, market access is equally important as finance; women entrepreneurs need access to procurement opportunities, service contracts and utility

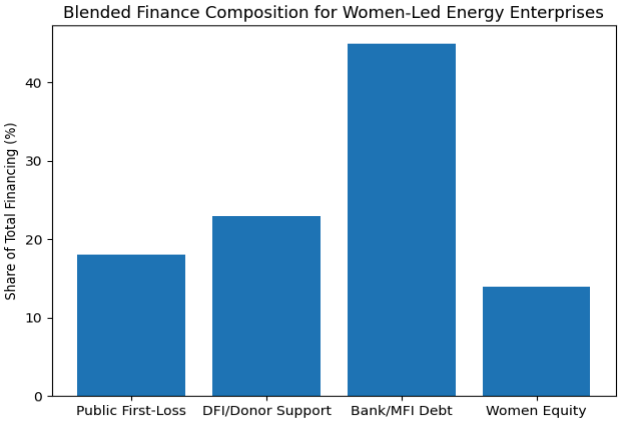
partnerships in order to create revenues. And, lastly, institutional accountability in the form of gender-disaggregated data, performance targets and a monitoring framework is critical to ensure that additional scale doesn't see gender inclusion pushed to one side.

These models provide a lesson for Pakistan as well. The problem is more a lack of integration than a lack of innovation. Most initiatives for renewable energy have been framed by deployment targets, and the financial systems are far from aligned with gender goals or market development. Copying global best practices needs adaptation, not replication: packaging concessional finance with local microfinance institutions, connecting women run enterprises to provincial energy programmes and utilities and mainstreaming gender criteria into public procurement and climate financing mechanisms. Without these reforms, Pakistan can end up following a technologically green transition that is still economically green. With them, the country also has an opportunity to turn renewable energy into a platform for women's entrepreneurship, rural economic diversification and widespread climate resilience.

Strategic Policy Recommendations

To operationalize gender inclusion in rural clean energy markets, Pakistan must adopt a coordinated set of financial, regulatory, and market-based reforms that explicitly address gendered barriers rather than assuming neutrality. First, the federal government, in coordination with provincial energy and finance departments, should establish a National Gender-Responsive Energy Finance Framework that embeds gender criteria into all renewable energy financing instruments, including subsidies, concessional credit lines, climate finance allocations, and donor-supported programs. This framework should require that a defined share of public and blended finance for decentralized renewable energy be directed toward women-led enterprises, with clear eligibility guidelines, reporting requirements, and performance indicators. International evidence shows that such earmarking, when combined with accountability mechanisms, significantly improves women's access to productive capital without distorting markets.

This analysis illustrates a proposed blended finance structure for women-led rural clean energy enterprises, highlighting how public and donor capital can strategically de-risk private lending while preserving women's ownership and equity participation.



Secondly, financial regulators particularly the State Bank of Pakistan must grow and deepen gender-inclusive banking reforms by requiring banks to report sex-disaggregated data on energy lending and providing incentives to financial institutions for developing products

that are tailored to women entrepreneurs in the energy sector. Risk perceptions associated with women-owned businesses can be mitigated through public sector risk-sharing instruments such as first-loss guarantees, partial credit guarantees, and interest-rate buy-downs for clean energy financing. Such mechanisms minimize lenders' risks and crowd in private sector capital, a pattern seen across South Asia and Sub saharan Africa's blended finance models. Furthermore, for concessional finance and asset-based lending initiatives women's names must be put on renewable energy assets like solar systems, batteries and productive-use equipment in order to build up their collateral base and bargaining power as well as long-term economic security.

Third, policy makers needed to shift away from a supply side finance approach and focus also on access to market and demand creation which were just as crucial to the sustainability of enterprises. There is a need for the development and implementation of gender responsive procurement policies that would give preference to women led enterprises in driving last mile distribution, installation, maintenance, and operation of renewable and decentralized energy systems by government departments including utilities at all levels (national, regional and municipal). Stable demand through public procurement and/or utility contracts can help these small firms smooth out revenue volatility, hence supporting WBEs' ability to scale up operations and invest in skills and technology. In addition, provincial energy departments could assist in the support of cooperatives and women entrepreneurs to manage off grid and mini-grid systems, particularly in lowincome, rural and peri-urban areas where decentralized solutions are most appropriate (ADB, 2023).

Fourth, financial inclusion must be systematically linked with skills development, business incubation, and market linkages. Access to credit without technical capacity and market connectivity risks high failure rates and reinforces stereotypes about women's entrepreneurial performance. Energy finance programs should therefore bundle capital with certification-based technical training, business development services, digital payment systems, and access to supplier and distributor networks. International experience shows that integrated finance-plus-capacity models yield significantly higher enterprise survival and growth rates than standalone credit interventions. In Pakistan, such integration would also align clean energy policy with broader goals of women's labor force participation, MSME development, and rural economic diversification.

Finally, and most importantly, strong monitoring and accountability mechanisms must be in place. Gender-sensitive energy finance would also be supported by a framework with defined indicators on women's asset ownership, participation in enterprise activity, income generation and movement through value chains. Transparent reporting and independent monitoring will prevent gender inclusion from becoming just an exercise in ticking the box of statistical targets, but is rather turned into tangible economic results. As has been repeatedly pointed out by Dawn and multilateral bodies, policies that fail to monitor gender outcomes run the risk of creating entrenched exclusion even if intentions are progressive.

Embedding Gender in Energy Governance

Pakistan's rural clean energy transition stands at decisive crossroads. As established in *Volume I*, gender inclusion is not an optional social add-on, but a structural requirement for an effective and just energy transition, given women's central role in household energy management, rural livelihoods, and climate resilience. This second volume has demonstrated that the success or failure of gender inclusion ultimately hinges on finance and markets, specifically, on whether women are enabled to participate as asset owners, entrepreneurs, and service providers within renewable energy value chains. Energy access alone, while essential, does not automatically translate into economic empowerment. Without deliberate reforms to financial systems, ownership structures, and market access mechanisms, renewable energy risks replicating the same gendered exclusions that characterize Pakistan's conventional energy economy.

The evidence set out here supports an important policy point: gender responsive financing is not a redistributive burden but a productivity enhancing corporate investment. Experience from South Asia, Africa and other emerging markets across the world has shown that when women are connected to clean energy markets through financial productivity, blended finance mechanisms and stable demand aggregators, results improve on all fronts better repayments, stronger enterprise performance, system longevity and social dividends. These results directly oppose the common assumptions that women-owned energy businesses are more risky or less scalable. On the contrary, women's exclusion indicates failures of market and institutional design not inherent limits to women's abilities or ambitions.

The consequences for Pakistan are economic and strategic. A man-owned, man-entrepreneured clean energy transition will stutter and stay shallow, fragmented and fiscally dependent on subsidies and donor aid. In contrast, a transition that integrates women into energy value chains can drive rural enterprise [and] bolster local economies with lower public expenditure over the longer term as self sustaining economic ecosystems are developed. These financial instruments acknowledge gendered barriers, procurement policies ensure access to the market and institutional reforms monitorgender results; all are central to a transition of such nature. Reporting and policy analysis featured by Dawn repeatedly reveals that for both durability and community acceptability, clean energy programs are more sustainable when women control assets and income streams.

Ultimately, the choice facing policymakers is not whether to pursue gender inclusion, but whether to design the energy transition for long-term economic transformation or short-term technological deployment. Gender responsive financing and market integration offer a pathway to align Pakistan's renewable energy goals with women's economic empowerment, MSME development, and climate resilience. Embedding these principles into national and provincial energy strategies, financial regulation, and climate finance frameworks will determine whether Pakistan's green transition becomes a driver of inclusive growth or a missed opportunity. A truly just energy transition is one in which women are not only

powered by clean energy, but empowered by it as owners, entrepreneurs, and leaders in the emerging low carbon economy.